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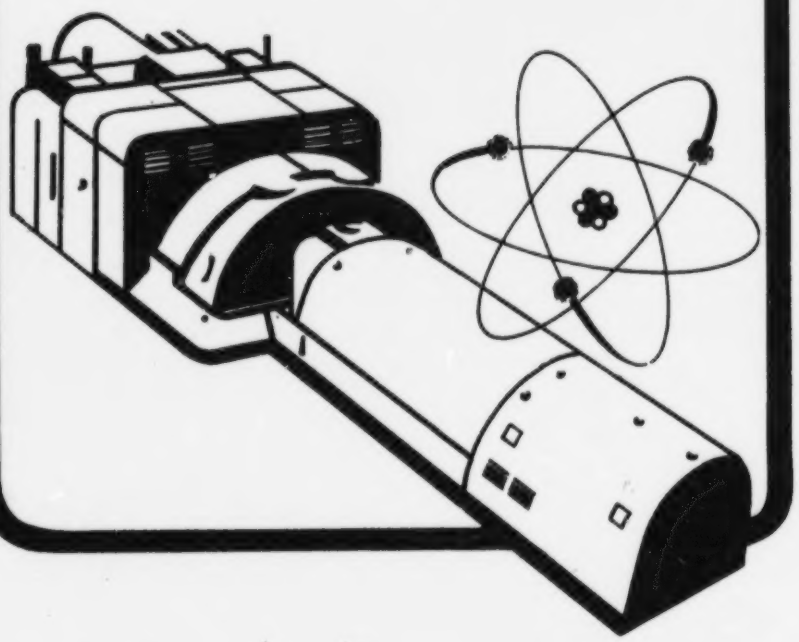
DUQUESNE LIGHT COMPANY

Shippingport Atomic Power Station

Quarterly

OPERATING REPORT



First Quarter 1968

Contract AT-11-1-292

United States Atomic Energy Commission

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Duquesne Light Company
Shippingport Atomic Power Station
Power Stations Department

QUARTERLY OPERATING REPORT
First Quarter 1968

DLCS 5000168

Approved By G. M. Oldham
G. M. Oldham
Superintendent

Contract AT-11-1-292
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Preface

This Quarterly Report is prepared and issued by the Duquesne Light Company to disseminate information relative to all significant activities conducted at the Shippingport Atomic Power Station. Consistent with the premise that Shippingport was built to provide information and not power at competitive costs, this report makes no effort to analyze power production costs and makes no deductions regarding costs which might be achieved if Shippingport had been built and operated solely to produce power.

In preparation of these reports, it has been presumed that the reader has a working knowledge of nuclear reactors, reactor technology and/or electric utility generating station operations. The reader is reminded, however, that this is an operating report rather than a technical report. Anyone desirous of obtaining advice on recent technical progress related to the nuclear portion of the Shippingport Atomic Power Station is therefore referred to the United States Atomic Energy Commission, Office of Technical Information Extension at Oak Ridge, Tennessee, where this information is readily available.

1. SUMMARY OF OPERATIONS

During the report period, the station was operated as required for testing, maintenance, training and in accordance with Duquesne Light Company system power demand. The quarter started with the 1A, 1C and 1D reactor coolant loops in service.

There were five scheduled station outages during the period. The first was an approximately fifteen hour outage beginning at 12:31 PM on January 7 to return the 1B coolant loop to service. A Core 1 refurbished coolant pump had been installed in the loop and was to be operated for a short period in parallel with three Core 2 pumps to confirm the adequacy of the Core 1 pumps as spares (see report of fourth quarter, 1967). The necessary Nuclear Protection System set point changes and quarterly interlock checks were made and the station was returned to service with four coolant loops in service. Following a six day satisfactory trial run, the 1B loop was again isolated and drained to permit ultrasonic testing and inspection of the heat exchanger tubes.

A station outage also took place from February 8 to March 1 for physics, equipment and instrumentation tests, preventive and major maintenance and periodic operating checks. A Reactor Coolant System hydrostatic test at 2750 psig was performed to test welds of a replaced reactor relief valve. Some training also took place during this outage.

The remaining three scheduled outages occurred overnight on January 18 and March 17 and the week end of March 9 for station operator training purposes only.

Difficulty was experienced with an abnormally high 1D Coolant Pump stator temperature during a station heat-up with three loops in service on January 24. Coolant pump temperatures always ran higher than normal at Coolant temperatures around 300F to 350F. This time the 1D pump stator temperature reached the alarm point of 300F in spite of the fact that cooling water to the pump had been increased from normal of 150 gpm (gallons per minute) to 170 gpm. The pump was switched to slow speed to decrease the temperature. Later the cooling water flow was increased to 190 gpm and the pump returned to fast speed operation. The stator temperature then settled at a peak of 281F at a coolant temperature of 345F. At a Reactor Coolant temperature of 425F, the pump stator temperatures had dropped to near normal so cooling water flow was returned to normal. Further investigation is being conducted of this problem.

Subsequent to the above, during power operation, obvious "clicking" noises were detected by the 1D Coolant Pump noise monitor. Local sounding of the pump did not indicate any unusual noise and vibration measurement demonstrated the pump vibratory displacement to be within specified tolerance.

The pump is being monitored closely.

During the prolonged February outage the sixteen inch Heat Dissipation System steam isolation valve was replaced with a split disc parallel gate valve. The valve had been cycled once by hand. After start-up the valve began leaking significantly (approximately two and one half gallons of condensate per hour). After ten cycles of the valve under steam pressure, the leakage reduced to approximately thirty milliliters per hour which is well within the leakage specification of 500 ml per hour maximum.

One additional significant operational condition was encountered during the report period. It was noted that leakage from the Reactor Coolant System was occurring back through the charging system on the order of twenty gallons per hour. This accounted for approximately one half of the coolant leak rate and possibly the presence of ammonium hydroxide in the Reactor Plant Water Storage Tank. For this to occur, two check valves, an air operated stop valve and a positive displacement charging pump had to leak back through. Preparations are being made to repair the faulty components.

Three reactor scrams occurred during the report period. The first scram, January 8 from power, was attributed to a faulty power range operational amplifier in the Nuclear Protection System 1A channel which introduced noise signals into the high power-to-flow ratio shutdown circuitry. The second scram, January 12 from power, occurred just following a load increase and prior to decreasing the nuclear channel gains to compensate for the changed rod height and xenon concentration. A subsequent small incremental outward rod movement caused the nuclear channel outputs to exceed the scram set point. The final scram occurred on February 26 during zero power physics testing when the reactor operator misjudged reactor controlling group rod worth and was unable to suppress reactor start-up rate in time to avoid exceeding the nuclear recorder contact scram set point.

In addition to the reactor scrams, two Safety Insertions occurred during zero power physics testing on February 8 and February 23. Both insertions were caused by high start-up rates which occurred while the operator was not monitoring the Nuclear Instrumentation channel with the highest start-up rate. The start-up rate meter had been removed from AUCTIONEER because of noise on one channel which interferred with the auctioneered signal. The situation was corrected.

One additional incident occurred when on March 10, the Radioactive Waste Disposal 1B Surge and Decay Tank floated within its concrete enclosure due to an excessive accumulation of condensate from a leaky steam trace steam trap and rainwater. The water was removed and the tank repositioned on its base with minimal damage occurring.

There were no shipments of radioactive waste during the report period.

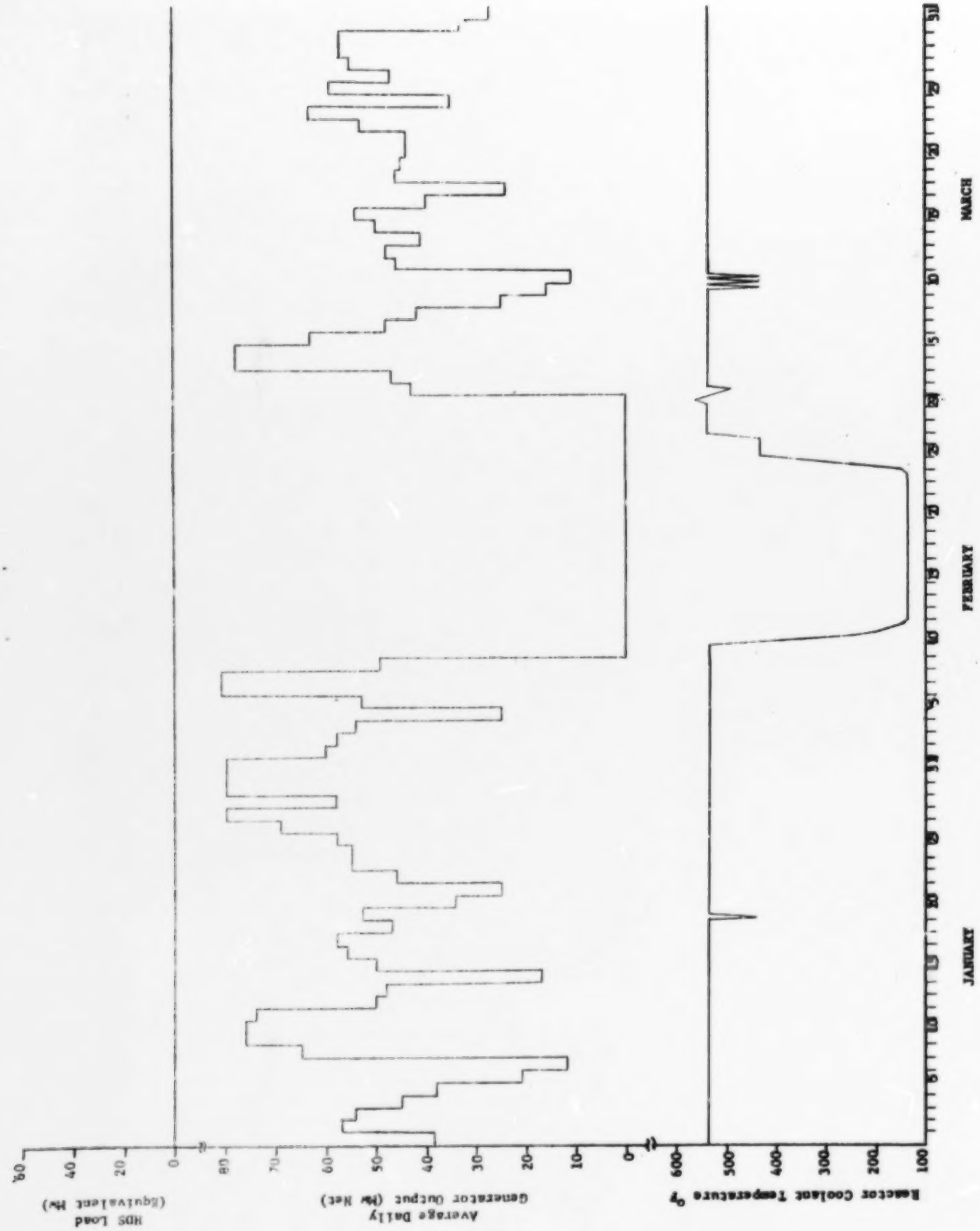

FIGURE 1

Generator Output, HDS Load and Reactor Coolant Temperature During First Quarter Period 1968

2. SUMMARY OF CORE 2 STATION PERFORMANCE

Electrical output (Gross) to date.....kwhr	1,579,183,100
EFPH to date (Blanket operating time).....hr	11,030.9
EFPH to date (Seed 1 operating time).....hr	11,030.9
EFPH for the quarterly period.....hr	685.8
Hours reactor critical to date.....hr	21,468.3
Hours reactor critical for the quarterly period....hr	1,648.5
No. 1 main unit service hours (quarterly period)...hr	1,556.5
Net Station output (quarterly period).....kwhr	78,208,200
No. of forced outages* (quarterly period).....	2

* Interruption of electrical output due to protective relay action and/or operator action as required to protect the Station.

3. CHEMISTRY

During the first quarter specified water conditions were maintained in the various plant systems and test support was provided during the performance of the following tests:

DLCS 59203	PWR Core 2 Reactor Coolant Crud Study (Crud Fractionation)
DLCS 66101	Control Rod Drive Mechanism Periodic Test

Reactor Plant

Standard reactor coolant specifications were utilized during power operations until March 22 in accordance with the Station Manual except that reactor coolant pH was controlled at 10.20 $\pm$ .1 and the total gas specified maximum was 125 cc/kg as requested by the Atomic Energy Commission. On March 22, the Station Manual was revised to include the aforementioned specifications for power operation. In addition the Manual revision provided the same pH range during shutdown if reactor coolant pumps are available for recirculation. The Station Manual was also revised to provide supplementary criteria for replacement of purification demineralizer resin. The external long lived radiation level of the demineralizer may be used as a basis for resin replacement.

Reactor coolant water conditions developed during power operations are summarized in Table I. The only out-of-specification value observed was a pH of 10.33. Table II contains a summary of reactor coolant conditions maintained during shutdown. A number of high out-of-specification pH values were obtained upon shutdown due to the lower shutdown pH specification in effect before March 22.

The Canal Water and Component Cooling Water Systems were maintained within reference water conditions.

The Coolant Charging Water was out of specification throughout most of the report period due to the effects of ammonium hydroxide. Daily analyses of the charging water were performed to insure water quality. An investigation into means of eliminating the ammonium hydroxide contamination of the primary tank was in progress at the end of the report period. The water conditions of these systems are summarized in Table III.

The Cesium-138 activity in the reactor coolant was determined on a routine basis during all plant power operations. The following tabulation lists the average Cesium-138 values calculated for each month of the report period. All values in the average were corrected to 67 percent reactor power, four reactor coolant loops and two purification demineralizers in service at 33,000 lb/hr flow.

Average Cesium-138 Activity

Month	dpm/ml	uc/ml	No. of Observations
January	576	2.62×10^{-4}	10
February	582	2.65×10^{-4}	2
March	575	2.62×10^{-4}	6

The final sample collection under Test DLCS 59203 Section "A" was in progress at the end of the report period. An evaluation of the results of the Section "A" will preceed sample collections under the remaining test sections.

The Chemistry section provided test support for DLCS 66101 by obtaining coolant activities and crud data as required.

The reactor coolant tritium activity on January 18 was 20 uc/liter.

The samples obtained December 28, 1967 at 10,300 EFPH for soluble and insoluble activity (as determined after each 1000 EFPH of Core 2 Seed 1 operation) were analyzed during the quarter and are reported in Tables IV and V. For comparison with results obtained prior to 9357 EFPH refer to the Third Quarterly Operating Report, 1967.

The BD purification demineralizer was in service from January 8 through January 12. No gross non-volatile gamma activity samples or crud samples were obtained from the inlet to the BD purification demineralizer during the report period. The AC purification demineralizer was in service for all power operations during the quarter. The gross non-volatile gamma activity at the purification demineralizer inlet after fifteen minutes decay was determined daily during power operations. The activity of these samples ranged from 15,070 cpm/ml at 13 percent reactor power to 124,330 cpm/m. at 40 percent reactor power. The later activity however was obtained following a reactor scram, isolation of the BD purification demineralizer and return to power. A more typical value was the next highest gross non-volatile gamma activity of 63,720 cpm/ml obtained at 57 percent reactor power. Ten 120 hr gross gamma activities exceeded 2000 cpm/ml during the quarter. Eleven determinations of the 15 minute DF during power

operations ranged from 444 to 1188. Eight routine crud samples were obtained at the AC purification demineralizer inlet during the period. The crud concentrations ranged from 1.90 ppb to 12.7 ppb and the average gross gamma activity after a 120 hr decay period was 2.80×10^7 cpm/mg.

Turbine Plant

Boiler water chemical control continued according to specifications adopted August 15, 1966. Few out of specification conditions were noted. No evidence of primary to secondary leakage was observed throughout the quarter. Low boiler chloride levels were maintained although the normal bi-weekly blowdown frequency was exceeded. The rate of boiler chloride buildup varied during the quarter. No detectable effect on the rate could be attributed to the return of the building heat drains to the condensate system. Normal boiler chloride increases were experienced near the end of the report period.

The 1A, 1C and 1D boilers were routinely utilized for power operations except during the cold lay up from February 11 to February 23. The 1B boiler was in service for power operations from January 8 through January 12, only. During this period, the 1B primary coolant loop was in service with a modified Core I coolant pump. The 1B boiler was maintained under cold lay up specifications during the remainder of the report period. Only several hydrazine additions were required to maintain specifications.

The water conditions of the boilers are summarized in Tables VI and VII. In this issue the tables have been expanded to show required specifications. Table VI summarizes boiler conditions during power operation. Table VII includes data from both hot and cold lay up conditions.

Radioactive Waste Disposal

Radioactive liquid waste was processed from ten surge and decay tanks during the quarter. All water processed was suitable for discharge to the environment. The tritium content of the processed water ranged from 13.2 uc/l to 21.0 uc/l. The Xe-133 activity present in the Vent Gas System ranged from 2.0 dpm/cc (9.1×10^{-7} uc/cc) to 24.0 dpm/cc (1.09×10^{-5} uc/cc) in the report period. Sixteen gas decay tanks were discharged in the period in order to maintain the oxygen content of the Vent Gas System by air addition.

TABLE I

Reactor Coolant System

Water Conditions and Chemical Adjustments

Operating Conditions

January 1 - March 31, 1968

Chemical Condition	Specifications	Analytical Results Min. Max.	NH_4OH Additions Liters	Degasification Hours
1. pH @ 25° C	10.20 ± .1	10.10 - 10.33	201	185
2. Specific Conductivity umhos	----	40 - 54		
3. Ammonia - ppm	----	23 - 32		
4. Total Gas - cc/kg	125 Maximum	59 - 107		
5. Hydrogen - cc/kg	10 - 60	31 - 57		

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TABLE II

Reactor Coolant System

Water Conditions and Chemical Adjustments

Shutdown Conditions

January 1 - March 31, 1968

Chemical Conditions	Temp.	Specifications	Analytical Results Min. Max.	NH_4OH Additions Liters	Degasification Hours
1. pH at 25° C	>200° F	9.80 - 10.20	9.95 - 10.30	14 1/2	38
	<200° F	6.00 - 10.50	9.60 - 10.19		
2. Total Gas - cc/kg	>200° F	100 cc/kg max.	20 - 53		
	<200° F	*	16 - 36		
3. Hydrogen - cc/kg	>200° F	10 - 60	10 - 30		
	<200° F	---	4 - 16		

* Total Gas must be reduced to less than 25 cc/kg before the Reactor Coolant System may be opened.

TABLE III

Reactor Plant Auxiliary Systems

Water Conditions

January 1 - March 31, 1968

System	Specific Conductivity umhos	pH at 25° C	Conc. - ppm			Gross Gamma * Activity-dpm/ml
			CrO_4	Cl	Dis. O_2	
Component Cooling						
Specifications	none	8.30-10.50	500-1000	<1.0	none	***
Observed	1400-2250	8.80-9.11	581-902	0.20-0.65	-	Bkgd.
Coolant Charging Water						
Specification	<2.5	6.00-8.00	none	<0.1	**	none
Observed	1.00-12.0	7.00-9.75	-	<.05	0.025-8.2	-
Canal Water						
Specification	<5.0	6.00-8.00	none	none	none	none
Observed	1.02-2.33	6.70-7.90	-	-	-	Bkgd. - 14 ± 12

* Multiply tabular value by 4.55×10^{-7} to obtain uc/ml
** Should be < 0.14 ppm for reactor plant cold shutdown
*** Normally near background

TABLE IV

PRIMARY SYSTEM RESIN AND CRUD ANALYSIS

EFPH	In Service Date	In Service Time	Out Service Date	Out Service Time	Type Sample	Volume Coolant Liters	Crud Weight mg	Resin Weight gms.	Sp. Act.* cpm/ml @ 120 hrs	Activity dpm/mg at 120 hr.** Co^{60}	Co^{58}	Fe^{59}	Cr^{51}	Mn^{54}	Hf^{181}	Zr^{95}	W^{187}	% γ Acc.
										$\times 10^6$	$\times 10^6$	$\times 10^5$	$\times 10^6$	$\times 10^5$	$\times 10^5$	$\times 10^4$		
9357	8/22/67	1345	8/24/67	1345	Crud	873	1.00		3.30×10^7	31.2	45.0	61.8	15.9	34.9	10.8	27.0		100
10308	12/26/67	1430	12/28/67	1430	Crud	880	2.05		4.23×10^7	43.3	45.2	43.2	9.4	37.2	15.6	25.2		90.5
9357	8/22/67	1345	8/24/67	1345	Resin	437		55.0	1.51×10^2	$\times 10^2$ 0.26	$\times 10^2$ 0.21	$\times 10$ 0.47	$\times 10$ ND	$\times 10^2$ 2.36		$\times 10^3$		55.9
10308	12/26/67	1430	12/28/67	1430	Resin	440		46.0	3.34×10^2	1.65	1.43	2.29	ND	2.79				61.2

* For conversion to the microcurie unit, multiply tabular value by 1.07×10^{-6}

** For conversion to the microcurie unit, multiply tabular value by 4.55×10^{-7}

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TABLE V

1000 Hour Fission and Activation Product Analysis

Core 2 Seed 1

1000 Hour Run Number & (EFPH)	Tritium uc/l	Cs 137 dpm/ml**	I 131 dpm/l**	I 133 dpm/ml**	Xe 133 dpm/ml**	Ar 41 dpm/ml**
1. (625)	5.7	N.D.	N.D.	10.7	77	1.50×10^5
2. (1828)	8.8	N.D.	1.16	21.2	--	--
3. (2580)	12.9	N.D.	1.85	30.0	75.8	1.63×10^4
4. (3636)	22.2*	0.12	4.80	58.4	82.1	3.60×10^4
5. (4475)	50.4*	0.12	3.08	34.5	75.6	3.65×10^4
6. (5350)	28.0*	0.20	2.82	48.6	125	7.20×10^4
7. (6650)	25.6*	0.16	3.10	44.0	86.1	1.22×10^5
8. (7540)	23.0*	0.18	6.39	47.9	97.3	7.82×10^4
9. (8300)	33.0*	0.16	6.60	80.3	92.8	4.73×10^4
10. (9357)	37.7	N.D.	8.40	104.0	53.6	4.60×10^3
11. (10308)	20.0	0.21	6.15	95.8	80.3	6.04×10^4

ND not detectable above background
* Average of monthly determinations
** Multiply tabular value by 4.55×10^{-7} to obtain uc/ml

TABLE VI

Operating Boiler Water Chemistry

Water Conditions

January 1 - March 31, 1968

Water Conditions	Specifications	Operating Boilers			
		1A	1B	1C	1D
1. Dis. Salts - ppm	Min. --- Max. 1000	43 155	122 133	43 157	53 150
2. Phosphate - ppm	Min. 5 Max. 100	26 58	60	18 100	22 52
3. Chloride - ppm	Min. 0 Max. 0.5	0.15 0.60	0.10 0.20	0.15 0.50	0.20 0.50
4. Hydrazine - ppm	Min. (residual) Max.	0.019 0.280	0.070	0.034 0.280	0.019 0.280
5. Silica - ppm	Min. 0 Max. 25	1.3 3.5	1.1	1.2 3.7	1.3 3.5
6. pH at 25° C	Min. (>9.50) Max.	9.78 10.53	10.45 10.60	9.60 10.60	9.70 10.48
7. Chemicals Used, Pounds					
Na_3PO_4		22	0	24	23
Na_2HPO_4		1	0	1	1
NaH_2PO_4		0	0	0	0

TABLE VII

Non-Operating Boiler Water Chemistry

January 1 - March 31, 1968

Water Conditions	Specifications *	Non-Operating Boilers			
		1A	1B	1C	1D
1. Dis. Salts - ppm	Min. -- Max. 1000	71 102	112 150	67 112	70 100
2. Phosphate - ppm	Min. 5 Max. 100	40 93	34 60	44 100	32 69
3. Chloride - ppm	Min. 0 Max. 0.5	0.10 0.35	0.10 0.30	0.10 0.41	0.10 0.44
4. pH at 25° C	Min. 10.00 ** Max. 11.00	10.18 10.82	10.10 10.74	10.12 10.84	10.12 10.72
5. Hydrazine - ppm (Hot lay-up)	Min. (residual) Max.	0.13 40	0.28 -	0.095 40	0.02 16.0
6. Hydrazine - ppm (Cold lay-up)	Min. 50 Max. 100	60 98	32 100	60 98	60 90
7. Chemicals Used, Pounds					
Na_3PO_4		17	12	12	17
Na_2PO_4		2		2	2
N_2H_4		23	24	16 1/2	23

* Specifications for items 1, 2, & 3 apply only to hot lay up. The table includes values observed under both hot and cold lay up conditions.

** The pH is maintained below the theoretical Na_3PO_4 - pH curve.

4. REFUELING PROGRAM

Preparation for the forthcoming PWR-2 Seed 1 - Seed 2 refueling operation continued throughout the quarterly report period. Refueling procedures were prepared and reviewed, the overall refueling plan and training documents were revised, and modification work in the Fuel Handling Building was also performed.

Refueling Procedures

The status of Duquesne Light Company prepared refueling procedures and the BAPL prepared procedures received by Duquesne Light Company for comment are summarized below.

Total number of procedures required for the PWR-2 Seed 1 - Seed 2 refueling operation	73
BAPL procedure drafts received by Duquesne Light Comapny for comment and comments submitted	35
Procedures assigned to Duquesne Light Company for preparation	35
Duquesne Light Company procedures submitted to BAPL for comment and BAPL comments received	35
Duquesne Light Company procedures submitted to and approved by the U. S. Atomic Energy Commission	35
*Duquesne Light Company procedures to be revised	31
*Duquesne Light Company revised procedures resubmitted to the U. S. Atomic Energy Commission	1

* These procedures, although approved by the U. S. Atomic Energy Commission, are subject to revision due to verification sign off requirements required to perform certain refueling operations and to new technical information. These procedures will be revised prior to signing the approved for performance copies.

All procedures will be reviewed and the approved for performance copies will be signed at least two weeks before the start of the refueling operation. Field changes, if any, will be incorporated into the procedure at the time.

Refueling Plan

The second issue of the refueling plan document, Section II, outlining the work required to be performed by Duquesne Light Company was submitted to the U. S. Atomic Energy Commission at the beginning of this report period. The plan includes listing of Duquesne Light Company prepared procedures, training required for various refueling operations and plant site operations (both technical and manual) required in preparation for the refueling operation. Updating of Section II of the refueling plan documentfor resubmittal was in progress at the end of this report period.

Training Program

The revised training program outline required for the refueling operation was resubmitted to the U. S. Atomic Energy Commission during this report period. The document outlines the training methods required for supervisory, technical and skilled crafts personnel. The training listed consists of lectures, demonstrations, practice operations and review of procedures. Training specifications referencing the actual refueling procedures for the practice operations were attached to this document. Practice operations will be performed on mockups using refueling tools and equipment.

Radiation Exposure Control Plan

The Radiation Exposure Control Plan document for the PWR-2 Seed 1 - Seed 2 refueling operation was submitted to the U. S. Atomic Energy Commission at the end of the previous report period (fourth quarter, 1967). This document outlined the requirements and program for radiation exposure control.

Technical Support

In addition to the preparation of the technical programs discussed above, technical support was also provided, as required, for the work performed in the Fuel Handling Building as described in Preparation of Fuel Handling Building which follows.

Preparation of Fuel Handling Building

The PWR-2 shroud lifting cable tie-off bar was relocated from the south wall to the east wall of the reactor pit.

Modification of the PWR-2 blanket assembly variable orifice adjustment tool remained 95 percent complete. Replacement parts are available but due to the work load schedule during the report period the modification was not completed.

An inventory of components and special equipment and tools required for the refueling operation was started during this report period.

Cleaning of the Fuel Handling Building equipment was initiated during the report period. The work consisted of cleaning components and special equipment and tools and the shelving at the north end of the Fuel Handling Building. The components and special equipment and tools were repackaged and identified and then placed on the shelving for storage. As of the end of this report period, the cleaning operation was 10 percent complete.

5. MAINTENANCE

During the first report period of 1968, maintenance effort was extended toward the scheduled plant shutdown for preventive maintenance, and repair of major components. In addition routine repairs of components, instruments and controls were performed and auxiliary equipment and instrumentation were calibrated, lubricated, overhauled, repaired and/or replaced. Repair and calibration of major components are described below.

B Main Coolant Pump

The modified Core I pump installed in the "B" loop during the fourth quarter 1967 was bolted to the volute casing and all electrical connections made. The pump was then checked out for proper rotation and placed into service.

Preventive Maintenance

During the scheduled plant shutdown various reactor plant valves not accessible during plant operation were repacked and repaired. The reactor plant relief valves were also checked and repaired or replaced. Fire extinguishers located throughout the reactor and boilers chambers were checked for proper operation, and safety equipment such as breathing apparatus and face masks were sent out to be repaired and reconditioned.

Leads and windings in the reactor main coolant pumps were meggered and the interlocks cleaned and inspected. Contacts and limit switches on various meters in the reactor plant were cleaned and inspected. All the switches, meters and gages on the reactor console were also cleaned and inspected. Temperature and pressure sensing devices were calibrated, and inspected. Devices found deficient were replaced.

Canal Water Tank

The tank was drained and inspected during the shutdown period. The inspection was performed to determine the cleanliness of the tank interior and for any possible defects. None were found. During the inspection period a leak in the canal water tank line was repaired.

Crane Test

The reactor plant cranes and overhead lifting devices were load tested to 125% of the manufacture's rated capacity. The limit switch settings on the fuel handling building main crane hooks were also checked.

B Loop Heat Exchanger

The 1B reactor coolant loop was isolated and removed from service to allow for the preparation of the 1B heat exchanger for an ultrasonic test and inspection of the boiler tubes. The primary and secondary side manways were removed and pipe plugs were installed in the 18 inch inlet and outlet piping of the heat exchanger. A platform was erected to provide a working area for men and equipment. Then the inlet and outlet plenum chamber and divider plate were electrolytically decontaminated. A frame was fabricated and installed in the outlet plenum chamber in front of the tube sheet. Lead sheets were then hung on the frame to reduce the radiation levels during the ultrasonic testing. Following the installation and checkout of the test equipment the ultrasonic test and inspection was started. The test will determine the extent of tube wall thinning since the last inspection and test performed during the second quarterly period of 1967. The ultrasonic test remained in progress at the end of the report period.

HDS Main Steam Valve

Due to steam leaking through the valve, the 16 inch HDS main steam valve was cut out of the line and replaced by prototype valve. The new valve was welded into the main steam line and weld areas were stressed relieved.

Reactor Relief Valve

During plant operation, one of the reactor relief valves exhibited excessive leakage. During the plant shut down the valve bonnet was cut to permit an inspection of the valve internals. A piece of metal was located between the disc and its seating surface. The piece of metal was assumed to be part of a filler metal ring. The welds on each side of the valve were then radiographed and determined to be unacceptable due to incomplete fusion of the filler metal rings. The valve was isolated by installing a freeze plug on the 4" supply pipe to the relief valve. Then the valve was cut out of the line and the weld areas were repaired. A spare relief valve was installed in the line, radiographed and the primary relief system was successfully checked out and returned to service.

6. TEST PROGRAM

The main objective of the test program during this report period was to continue reactivity depletion of Core 2 - Seed 1 to determine irradiation lifetime properties, reactivity lifetime properties and the core power distribution as a function of lifetime with respect to extended life operations of Core 2 - Seed 1. Other objectives of the test program during this same period were to perform periodic calibration of some of the primary plant pressure, level, and temperature instrumentation, and secondary plant instrumentation. Physics tests were performed to determine rod worth, temperature coefficient of reactivity at full power (equilibrium xenon) conditions, reactivity loss rate and critical control rod bank heights, and reactivity worths for various symmetric control rod configurations at operating temperature and pressure. Other tests were performed to check the FEDAL System calibration and operation, and Axial Flux System Operation. Axial flux measurement tests were performed at full power (equilibrium xenon) conditions, peak xenon, return time, and at xenon free conditions. Radiation surveys were performed on the reactor vessel head, coolant loops and piping, and tests were also performed to check reactor plant integrity.

Thirty two tests were performed during the report period. Twenty nine tests were completed and three tests remained in progress at the end of the quarter. Table VII lists these tests and figure 2 displays the actual performance dates. Information pertaining to the chemistry tests may be found in the chemistry section of this report.

The Periodic Reactor Plant Leak Rate Test (DLCS 58401) was performed February 6 and 9, and March 4 and 7. One of the relief valves (06-H15-3) had to be replaced due to excessive leakage. The Reactor Plant Container Integrity Test (Butterfly Valve Test) was performed February 13 and 14 for the 1A and 1B exhaust valve. The 1A valve seats were ground, polished and adjusted. An acceptable leak rate was then obtained.

The FEDAL System was aligned once during this report period (DLCS 58201). An activity check of all Core 2, Seed 1 fuel elements (DLCS 58401) was performed. Fuel element G-7 was monitored by the FEDAL System January 8, 13, 19 and March 1 and 19 (DLCS 58301) during station start-up. All FEDAL tests yielded normal results except for the high background activity in (DLCS 5820119). The background was lower than the background observed in performances (DLCS 5820115 thru 118) due to re-alignment of the BF3 tubes in the monitor and the lowering of the BF_3 voltages. However, the background is still higher than expected. Further evaluation of this abnormality remained in progress.

Radiation surveys were performed on the 1A, 1C, 1D reactor coolant loops, and the 1AC purification loop and demineralizer (DLCS 58501) January 18 and February 12. A radiation survey of the reactor vessel head (DLCS 58601) was performed February 12, and again February 27 and 28 to determine radiation levels on the control rod mechanisms in conjunction with the control rod scram test in DLCS 66101 - Control Rod Drive Mechanism Periodic Test. The results of these last two surveys indicated increased activity resulted in the upper part of the control rod mechanisms following the control rod scram test.

The Nuclear Protection System (DLCS 60801 and 60802) was checked out during the period of February 19 thru 21 and February 24. The response times for the circuitry to react were acceptable.

Calibration of primary instrumentation for temperature (DLCS 60901), pressure (61001), level (61201) and the Data Acquisition System (60401) were performed during this report period. All of the calibrations were acceptable.

The Axial Flux Measurement tests (DLCS 63502 and 63503) were performed four times during this report period. Flux wires were irradiated at full power (equilibrium xenon), peak xenon, and return time and xenon free conditions after a shutdown from a 100 Mw condition.

Control Rod Position for Criticality at operating temperature (DLCS 63701) was performed to obtain critical bank height and rod worth at operating conditions and at cold plant conditions.

The following tests remained in progress at the end of this report period:

DLCS 59203 - PWR Core 2 Reactor Coolant Crud Study (Crud Fractionation)

DLCS 65901 - Reactor Pressure Drop and Coolant Flow Characteristics During Power operations

DLCS 66001 - Reactivity Lifetime Test

The Data Acquisition System (DAS) was successfully programmed to obtain operational data on the modified Core I reactor coolant pump during its initial startup and operation with the other three Core 2 pumps. The Core I reactor coolant pump was installed in the 1B loop to replace the Core 2 pump which failed. Further uses of special programs in the DAS are planned.

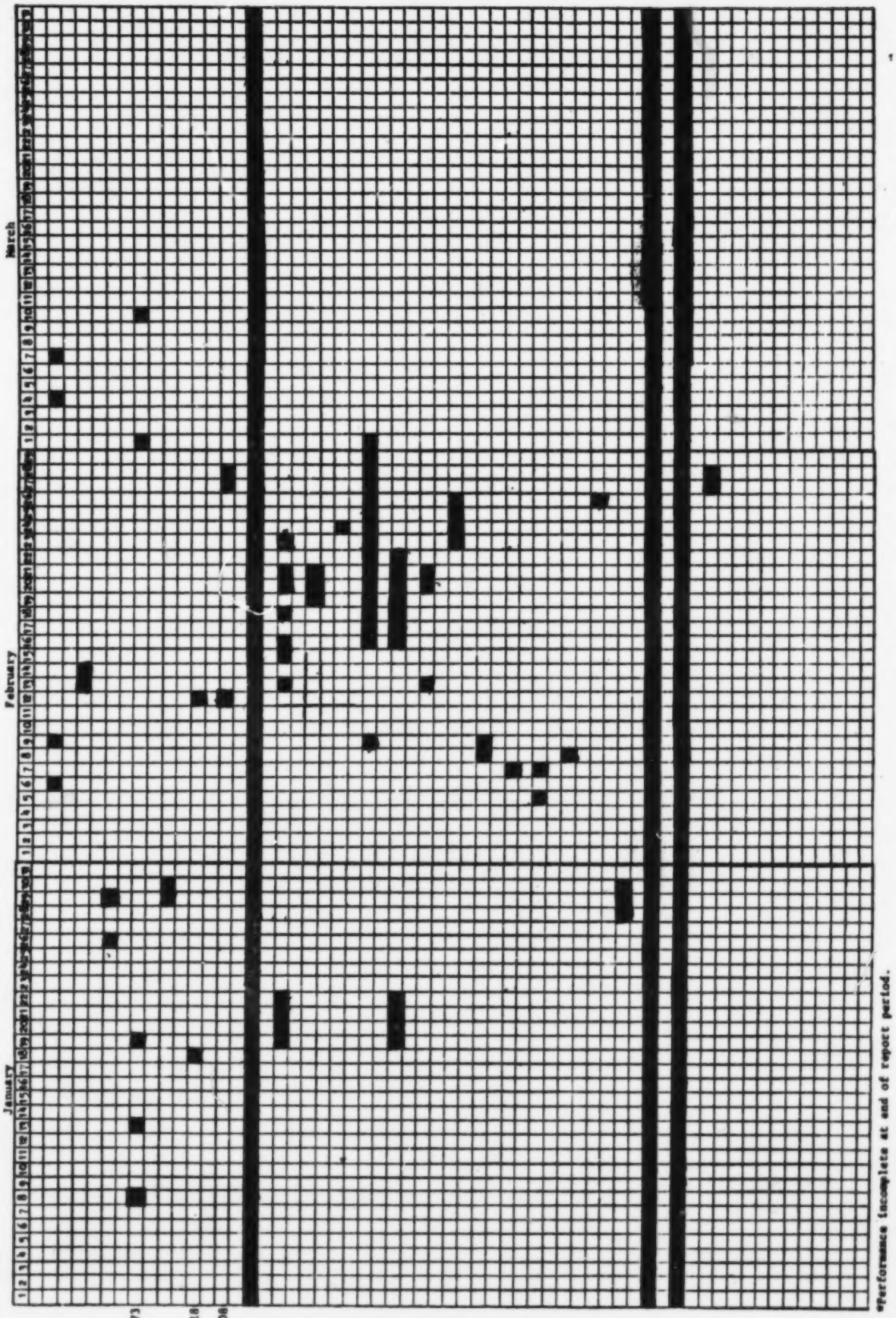
TABLE VIII

Tests Performed During First Quarter of 1968

DLCS 5640104	Periodic Reactor Plant Leak Rate Test
DLCS 5680206	Reactor Plant Container Integrity Test (Butterfly Valve Test)
DLCS 5820119	FEDAL System (Check-out Test)
DLCS 5830168 thru 73	FEDAL System (Operation during plant start-up)
DLCS 5840118	FEDAL System Operational Test
DLCS 5850117,18	External Radiation Levels of Reactor Coolant System piping and Components
DLCS 5860106,07,08	Radiation Survey of Reactor Vessel Head
DLCS 5920301	PWR Core 2 Reactor Coolant Crud Study (Crud Fractionation)
DLCS 6040106	Data Acquisition System Calibration Test
DLCS 6080103	Nuclear Protection System (Checkout of High Th and P/F Circuitry
DLCS 6080203	Nuclear Protection System (Checkout of Pump Power, SLOFA and CLOFA Circuitry)
DLCS 6090106	Periodic Intercalibration of Temperature Sensing Elements
DLCS 6100106	Periodic Calibration of Pressure Instrumentation
DLCS 6120104	Periodic Calibration of Pressurizer Level Instrumentation
DLCS 6320103	Measurement of Coefficients of Reactivity
DLCS 6330107	Xenon Transient Test
DLCS 6340105	Temperature Coefficient of Reactivity at Power
DLCS 6350218	Axial Flux Measurement Test (Full Power - Equilibrium Xenon)
DLCS 6350308	Axial Flux Measurement Test (Xenon Transient)
DLCS 6370106	Control Rod Position for Criticality at Operating Temperature (Critical Bank Height and Bank Worth Measurement)
DLCS 6400106	Reactivity Loss Rate Coefficient
DLCS 6590101	Reactor Pressure Drop and Coolant Flow Characteristics During Power Operations
DLCS 6600101	Reactivity Lifetime Test
DLCS 6610103	Control Rod Drive Mechanism Periodic Test

FIGURE 2

PERFORMANCE DATES OF TESTS PERFORMED DURING FIRST QUARTER OF 1968



*Performance incomplete at end of report period.

7. GLOSSARY

AEC.....United States Atomic Energy Commission

AIX.....after ion exchanger (outlet)

a/o.....atomic percent

BAPL.....Bettis Atomic Power Laboratory

BIX.....before ion exchanger (inlet)

bkgd.....background

CIC.....compensated ionization chamber

DAS.....Data Acquisition System

DE.....demineralizer effluent

DF.....decontamination factor

EFPH.....equivalent full power hour

FEDAL.....Failed Element Detection and Location System

FMI.....flow measurement instrumentation

Hc.....critical height

HDS.....Heat Dissipation System

megamp.....magnetic amplifier

MELBA.....Multipurpose Extended Life Blanket Assembly

mr.....milliroentgen

mrem.....milliroentgen equivalent man

NPS.....Nuclear Protection System

ORMS.....Operational Radiation Monitoring System

PWR.....Pressurized Water Reactor

R.....roentgen

RC.....resistance capacitance

μc.....microcuries

RCS.....Reactor Coolant System

rem.....roentgen equivalent man

RPC.....Reactor Plant Container

RWDS.....Radioactive Waste Disposal System

STP.....standard temperature and pressure

su.....smear unit (100 sq. cm.)

Tavg.....average reactor coolant temperature

Tc.....reactor coolant inlet temperature

Th.....reactor coolant outlet temperature

Ts.....time of sample isolation

v/o.....percent by volume

VOS.....Valve Operating System